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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re U.S. Patent Application of)
)
FUKUDA et al.) Art Unit 2652
)
Application Number: 10/763,302)
)
Filed: January 26, 2004)
)
For: COOLING STRUCTURE FOR DISK STORAGE DEVICE)
)
Attorney Docket No. HITA.0504)

Honorable Assistant Commissioner
for Patents
Washington, D.C. 20231

COVER LETTER

Sir:

[x] The fee for submission of claims is calculated as shown below:

FOR	TOTAL WITH NEW CLAIMS ADDED	TOTAL CURRENTLY ON FILE	CLAIMS PAID	RATE	CALCULATION
Total Claims	13	14	(Over 20)	x \$18	0
Independent Claims	3	3	(Over 3)	x \$88	0
MULTIPLE DEPENDENT CLAIM(S)				+ \$300	0
REDUCTION FOR FILING BY SMALL ENTITY (note 37 C.F.R. §§ 1.9, 1.27, 1.28). IF APPLICABLE, VERIFIED STATEMENT MUST BE ATTACHED				x ½	
			TOTAL		0.00

In addition, the below-identified communications are submitted in the above-captioned application or proceeding:

- | | |
|--|--|
| <input type="checkbox"/> Response to Office Action
(with Claim Amendments) | <input checked="" type="checkbox"/> Information Disclosure Statement |
| <input type="checkbox"/> Substitute Specification | <input type="checkbox"/> Terminal Disclaimer |
| <input checked="" type="checkbox"/> Preliminary Amendment w/ claim amendments | <input type="checkbox"/> Letter to Draftsperson |
| <input checked="" type="checkbox"/> Statements & Pre-exam search report with
References | <input type="checkbox"/> Assignment |
| | <input checked="" type="checkbox"/> Petition to Make Special under 37 CFR
§1.102(d) for Accelerated Examination |

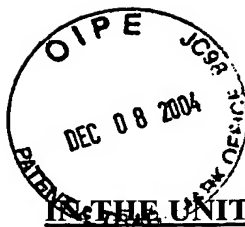
- [] Please charge my **Deposit Account Number** _____ in the amount of _____ to cover the fees for _____. A duplicate copy of this paper is enclosed.
- [x] A check in the amount of **\$130.00** to cover the petition fee is enclosed.
- [x] The Commissioner is hereby authorized to charge any additional fees associated with this communication, ior credit any overpayment to **Deposit Account Number 08-1480**.

Respectfully submitted,

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December 8, 2004



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FUKUDA et al.

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For: COOLING STRUCTURE FOR DISK STORAGE DEVICE)

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Art Unit 2652

**Honorable Assistant Commissioner
for Patents
Washington, D.C. 20231**

PETITION TO MAKE SPECIAL UNDER 37 C.F.R. § 1.102(d)
FOR ACCELERATED EXAMINATION

Sir:

Pursuant to 37 C.F.R. § 1.102(d), Applicant respectfully requests the application to be examined on the merits in conjunction with the pre-examination search results, the detailed discussion of the relevance of the results and amendments as filed concurrently.

Substantive consideration of the claims is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicant's undersigned representative at the address and telephone number indicated below.

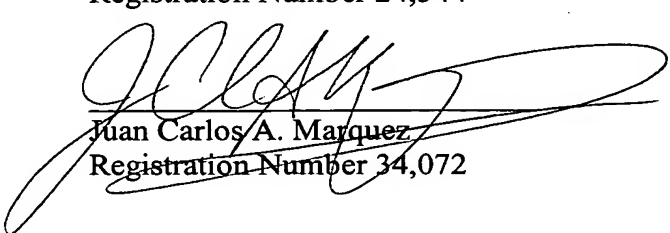
Respectfully submitted,

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Washington, D.C. 20231**

STATEMENTS & PRE-EXAMINATION SEARCH REPORT
SUPPLEMENTAL TO
THE PETITION TO MAKE SPECIAL

Sir:

Pursuant to 37 C.F.R. §§ 1.102 and MPEP 708.02 VIII, Applicant hereby submits that (1) all claims of record are directed to a single invention, or if the Office determines that all the claims presented are not obviously directed to a single invention, will make an election without traverse as a prerequisite to the grant of special status; (2) a pre-examination search has been conducted according to the following field of search; (3) copies of each reference deemed most closely related to the subject matter encompassed by the claims are enclosed; and (4) a detailed discussion of the references pointing out how the claimed subject matter is patentable over the references is also enclosed herewith.

FIELD OF THE SEARCH

An initial search was conducted with the US Patent Office's Examiner Application Search Tool (EAST) database and image retrieval system. The EAST database contains images of all issued US patents and published US patent applications searchable by subclass or document number. The EAST database also includes: the searchable full text of US patents issued since 1971; the searchable full text of all US published patent applications; and the searchable abstracts of a large number of patents and patent applications from the European and Japanese Patent Offices. Keyword searching and forward/backward cross-referencing

were used to locate relevant art, and we also searched, in particular, in the following *US Manual of Classification* subclasses:

Class	Subclass
165	80.2, 80.3, 80.4, 104.33, Dig.48
312	223.2
361	687, 697, 698, 699, 700, 701, 702, 703
454	184

A search for foreign art using the European Patent Office's ESPACENET database was also conducted, in particular, in international subclass G11B033/14B2 directed to reducing the influence of temperature by fluid cooling. A search for relevant literature using the DIALOG online databases was further conducted.

The search was directed to a cooling structure for a disk storage device, a disk array apparatus, and a cooling structure for a unit-accommodating enclosure, wherein the disk storage device includes a connection board to which a disk drive is electrically connected, such that input and output with the disk drive is performed via a signal line formed on the connection board. A heat absorbing part is provided on the disk drive, and a heat dissipating part is provided so as to be exposed outside the disk storage device. A heat-transferring part connects the heat-absorbing part and the heat-dissipating part. Heat generated by the disk drive is transmitted from the heat-absorbing part via the heat-transferring part to the heat-dissipating part to radiate the heat. Because of the cooling structure, an opening for air cooling is substantially eliminated from the connection board.

Under additional aspects, the disk storage device accommodates a plurality of disk drives, and substantially no clearance for air cooling exists between the disk drives, or between the disk drives and the housing of the disk storage device. Further, the heat transferring part can include a heat-absorbing-side heat-transferring part coupled to a heatdissipating-side heat-transferring part for producing a separable configuration. Also, the heat-absorbing part may cover a surface of the disk drive and may include a heat pipe. Additionally, a cooling mechanism may be provided for removing heat radiated from the heat dissipating part, such as by air cooling or liquid cooling.

LIST OF RELEVANT REFERENCES

The search revealed the following U.S. patents, which are listed for convenience:

<u>U.S. Patent No.</u>	<u>Inventor</u>
US 5365749	Porter, Warren W.
US 6115251	Patel, Chandrakant et al.
US 6144553	Hileman, Vince P. et al.
US 6349031	Lin, Bo-Yao et al.
US 6560107	Beck, Paul J. et al.
US 6608751	Ishimine, Junichi et al.
US 6778393	Messina, Gaetano P. et al.
US 20040190255	Cheon, Kioan

Discussion of References:

US Pat. No. 5365749 to **Porter** shows in FIG. 5 a heat transferring part 118B that is separable from a heat absorbing part 118A. However, **Porter** is directed to a cooling system for processors rather than any disk storage device or disk drive. In addition, the heat transferring part 118B does not separably include a heat-absorbing-side heat-transferring part coupled to the heat-absorbing part and provided at the disk drive side, and a heat-dissipating-side heat-transferring part coupled to the heat-dissipating part and provided at the connection board side, tooth portions of the heat-absorbing-side heat-transferring part and tooth portions of the heat-dissipating-side heat-transferring part fit together to provide surface contact. **Porter** also fails to teach other aspects of the present invention, such as substantially no clearance for air cooling exists between the disk drives. As such, **Porter** does not provide “a heat transferring part separably including a heat-absorbing-side heat-transferring part coupled to the heat-absorbing part and provided at the disk drive side, and a heat-dissipating-side heat-transferring part coupled to the heat-dissipating part and provided at the connection board side, tooth portions of the heat-absorbing-side heat-transferring part and tooth portions of the heat-dissipating-side heat-transferring part fitting together to provide surface contact” as now recited in claim 1 of the present invention.

US Pat. No. 6115251 to **Patel** et al. shows in FIG. 5 a heat pipe 31 in contact with a disk drive 15 for transferring heat from the disk drive 15 to a side panel 19 of an enclosure 23. While **Patel** only teaches a heat absorbing seat including mounting brackets 17, enclosure side panels 23a, 23b provided under the disk drive 15 in Figs. 2-3. **Patel** does not teach other

aspects of the presents invention, including a heat dissipating part exposed outside the disk storage device. In addition, **Patel** does not provide “a heat transferring part separably including a heat-absorbing-side heat-transferring part coupled to the heat-absorbing part and provided at the disk drive side, and a heat-dissipating-side heat-transferring part coupled to the heat-dissipating part and provided at the connection board side, tooth portions of the heat-absorbing-side heat-transferring part and tooth portions of the heat-dissipating-side heat-transferring part fitting together to provide surface contact” as now recited in claim 1 of the present invention.

US Pat. No. 6144553 to **Hileman** et al. describes a refrigeration system for a disk drive storage that includes disk drives 102 sandwiched by thin conducting plates 104. Each of the conducting plates 104 is connected to a heat pipe 110 for transferring heat to a chilled manifold or expansion chamber 108. **Hileman** simply does not provide “a heat transferring part separably including a heat-absorbing-side heat-transferring part coupled to the heat-absorbing part and provided at the disk drive side, and a heat-dissipating-side heat-transferring part coupled to the heat-dissipating part and provided at the connection board side, tooth portions of the heat-absorbing-side heat-transferring part and tooth portions of the heat-dissipating-side heat-transferring part fitting together to provide surface contact” as now recited in claim 1 of the present invention.

US Pat. No. 6349031 to **Lin** et al. describes a storage box for hard disk drives that includes cooling modules for each disk drive, whereby cooling air is drawn into the storage box by the cooling modules. Thus, **Lin** does not teach the present invention in which an opening for air cooling is substantially eliminated from the connection board as now recited in claim 1 of the present invention. In addition, **Lin** does not provide “a heat transferring part separably including a heat-absorbing-side heat-transferring part coupled to the heat-absorbing part and provided at the disk drive side, and a heat-dissipating-side heat-transferring part coupled to the heat-dissipating part and provided at the connection board side, tooth portions of the heat-absorbing-side heat-transferring part and tooth portions of the heat-dissipating-side heat-transferring part fitting together to provide surface contact” as now recited in claim 1 of the present invention.

US Pat. No. 6560107 to **Beck** et al. teaches a cooling device for a plurality of hard drives in which the hard drives are sandwiched between a plurality of cooling plates. The cooling plates are in contact with a cooling box into which coolant is admitted. Although

Beck teaches the elimination of air cooling openings, **Beck** does not teach other aspects of the present invention, such as the separability of the heat transferring part. **Beck** simply does not provide “a heat transferring part separably including a heat-absorbing-side heat-transferring part coupled to the heat-absorbing part and provided at the disk drive side, and a heat-dissipating-side heat-transferring part coupled to the heat-dissipating part and provided at the connection board side, tooth portions of the heat-absorbing-side heat-transferring part and tooth portions of the heat-dissipating-side heat-transferring part fitting together to provide surface contact” as now recited in claim 1 of the present invention.

US Pat. No. 6608751 to **Ishimine** et al. teaches a cooling system for a processor that includes a plate shaped heat pipe base 24 in which refrigerant is circulated. Heat radiators 26 are connected to the base 24. Although **Ishimine** teaches a heat-absorbing heat pipe and a heat dissipating portion, **Ishimine** does not show the heat dissipating part exposed outside the disk storage device as now recited in claim 1 of the present invention. In addition, **Ishimine** simply does not provide “a heat transferring part separably including a heat-absorbing-side heat-transferring part coupled to the heat-absorbing part and provided at the disk drive side, and a heat-dissipating-side heat-transferring part coupled to the heat-dissipating part and provided at the connection board side, tooth portions of the heat-absorbing-side heat-transferring part and tooth portions of the heat-dissipating-side heat-transferring part fitting together to provide surface contact” as now recited in claim 1 of the present invention.

US Pat. No. 6778393 to **Messina** et al. describes a cooling device in Fig. 1 with multiple compliant elements 41 each for cooling a chip 14a or 14b. As illustrated in FIG. 2, each of the compliant elements 41 includes a main body 42 and a cooling head member 44 with interfitting fin structures, which, when brought together, form a narrow coolant path. However, **Messina** is directed to a cooling unit for semiconductor chips, rather than for disk drives. In addition, **Messina** fails to teach a number of aspects of the invention, including a heat dissipating part exposed outside the disk storage device. As such, **Messina** does not provide “a heat transferring part separably including a heat-absorbing-side heat-transferring part coupled to the heat-absorbing part and provided at the disk drive side, and a heat-dissipating-side heat-transferring part coupled to the heat-dissipating part and provided at the connection board side, tooth portions of the heat-absorbing-side heat-transferring part and tooth portions of the heat-dissipating-side heat-transferring part fitting together to provide surface contact” as now recited in claim 1 of the present invention.

US Pat. App. Pub. No. 20040190255 of **Cheon** describes a cooling jacket which can be installed at various electronic devices, such as hard disk drives, video cards, memory cards, or printed circuit boards. The pouch is connected to coolant circulation lines for circulating coolant. FIG. 2 illustrates a pouch 10 disposed between two hard disk drives 1. **Cheon** fails to teach several aspects of the present invention, such as “a connection board to which a disk drive is electrically connected such that data I/O with the disk drive is performed via a signal line formed on the connection board” as now recited in claim 1. In addition, the heat transferring portion of **Cheon** is not easily separable because of the use of coolant lines to transfer heat. Moreover, **Cheon** does not provide “a heat transferring part separably including a heat-absorbing-side heat-transferring part coupled to the heat-absorbing part and provided at the disk drive side, and a heat-dissipating-side heat-transferring part coupled to the heat-dissipating part and provided at the connection board side, tooth portions of the heat-absorbing-side heat-transferring part and tooth portions of the heat-dissipating-side heat-transferring part fitting together to provide surface contact” as now recited in claim 1 of the present invention.

CONCLUSION

Based on the results of the comprehensive prior art search as discussed above, Applicants contend that the position calculation method as now recited in independent claims 1 and 13-14, especially the feature of a heat-transferring part with two separable heat transfer portions having tooth portions fitted with each other is patentably distinct from the cited prior art references.

In particular, the cooling structure (e.g., Figs. 2-3) for a disk storage device accommodating at least one disk drive 20 of the invention, as now recited in claim 1, comprising: the disk storage device 10 having a connection board 30 to which the disk drive 20 is electrically connected such that data input/output to/from the disk drive 20 is performed via a signal line formed on the connection board 30; a heat-absorbing part 40 provided on the disk drive 20; a heat-dissipating part 50 exposed outside the disk storage device 10; and a heat-transferring part 60 for connecting the heat-absorbing part 40 and the heat-dissipating part 50. Heat generated by the disk drive 20 is transmitted from the heat-absorbing part 40 via the heat-transferring part 60 to the heat-dissipating part 50 to radiate the heat, whereby an opening for air cooling is substantially eliminated from the connection board 30. The heat-

transferring part 60 (Fig. 5; pp.19-20) separably includes a heat-absorbing-side heat-transferring part 61 coupled to the heat-absorbing part 40 and provided at the disk drive side, and a heat-dissipating-side heat-transferring part 62 coupled to the heat-dissipating part 50 and provided at the connection board side, tooth portions 61a of the heat-absorbing-side heat-transferring part 61 and tooth portions 62a of the heat-dissipating-side heat-transferring part 62 fit together (p. 19, 1st paragraph) to provide surface contact (p. 20, lines 19-20).

Claim 13 recites a disk array apparatus comprising: a plurality of disk storage devices for connecting a plurality of disk drives to a connection board having a signal line for electrically connecting the disk drives with each other, and for accommodating the disk drives substantially in close contact with each other, and a cooling structure substantially similar to the one recited in claim 1.

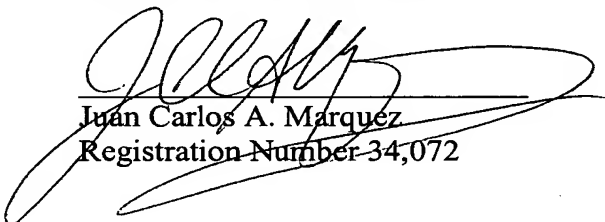
Claim 14 recites a cooling structure for a unit-accommodating enclosure accommodating at least one unit having a heat producing area inside, comprising: the unit connected to a connection board on which an information transmission path is formed such that information input/output to/from the unit is performed via the information transmission path, and a heat-absorbing part provided on the unit, as well as the heat-dissipating part, the heat-transferring part as recited in claim 1.

In view of all the above, clear and distinct differences as discussed exist between the present invention as now claimed and the prior art references, Applicant respectfully contends that the prior art references cannot anticipate the present invention or render the present invention obvious. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable consideration of this application is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicant's undersigned representative at the address and phone number indicated below.

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